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COMPLICATIONS OF BRAIN TUMORS

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Abstract
Despite the extensive use of modern radiation imaging technologies in neurosurgical practice, the diagnosis and treatment of various brain tumors (BT) remain a challenge for clinicians and healthcare administrators. This is attributed to the high prevalence of primary and secondary brain tumors, the significant number of adverse outcomes, and the substantial costs associated with their treatment.

Keywords: Benign tumor, malignant, premalignant, cranial, instrumental examination.

Introduction

The relevance of research. Brain and central nervous system (CNS) cancer is a significant global public health concern due to its high mortality rate, economic impact on individuals and society, low survival rates, and profound effects on patients' quality of life. Brain and central nervous system (CNS) cancers are a significant global health issue. In 2020, there were approximately 308,102 new cases of brain and CNS tumors worldwide. These cancers represent about 1.6% of all new cancer diagnoses globally. Additionally, the disease accounted for 251,329 deaths, making it one of the leading causes of cancer mortality. Survival rates for brain and CNS cancers vary by region and healthcare accessibility, but the prognosis often remains poor due to the aggressive nature of many tumors and challenges in early detection. Neuroimaging plays an increasingly critical role in diagnosing, planning treatment, and assessing outcomes for brain tumors. This review highlights current CT scan methodologies commonly used in brain tumor care, focusing on advanced techniques like contrast-enhanced and non-contrast CT scans for noninvasive tumor characterization and pretreatment assessment. It also explores the value of these imaging methods in evaluating brain conditions, emphasizing the challenges posed by findings such as sclerosis, cysts, and hematomas, which can mimic brain cancer.

Since the early days of independence of Uzbekistan, systematic efforts have been undertaken to establish a high-quality healthcare system in our country. These include implementing effective healthcare models and achieving notable progress in improving the diagnosis of brain disorders through the integration of advanced radiation diagnostic technologies like multispiral computed tomography (MSCT). MSCT enables detailed examination of various brain conditions. Despite these advancements, challenges remain in the healthcare system, particularly in radiation

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diagnostics. A critical issue is the timely detection of life-threatening brain tumors at the earliest possible stages.

Purpose of the research. To provide a comprehensive understanding of the capabilities of modern computed tomography techniques in diagnosing various brain tumors.

Materials and methods of research. Patients diagnosed with brain tumors and receiving care at the Oncology Dispensary in the Andijan region will be selected for the study.

Result of investigation. Postoperative evaluation of patients with glial brain tumors using CT and MRI allows for detailed assessment of brain structures following total tumor removal and visualization of reactive postoperative changes caused by surgical intervention. Key findings include the absence of a tumor mass in the postoperative cavity, edematous brain tissue around the cavity with unclear boundaries, absence of scarring or dislocation, and a reduction in reactive changes after dehydration therapy. CT imaging revealed postoperative scarring as areas of slightly increased density with well-defined borders within the cerebrospinal fluid-filled cavity. These areas did not exhibit enhanced density following contrast administration and showed no mass effect on brain structures, as evidenced by the lack of midline displacement, compression of liquor spaces, or brain herniation. A primary goal of CT and MRI in the postoperative phase is to identify any residual tumor tissue, aiding prognosis and further treatment planning. Residual tumor tissue was identified in 48 patients who underwent partial or subtotal tumor resection, while it was found in 9 of the 34 cases of total resection. No residual tumor was detected in 20 patients, and in 5 cases, assessment was hindered by postoperative hematoma. Contrast-enhanced CT within 24 hours post-surgery improved visualization of residual tumor tissue. However, MRI on the first postoperative day revealed a 50% increase in signal intensity from hemoglobin breakdown products, complicating interpretation when using contrast agents. For early complications within three days post-surgery (e.g., hemorrhage, edema, brain displacement, ischemia, hydrocephalus, pneumocephaly), accelerated CT protocols are preferred due to their reduced susceptibility to motion artifacts compared to prolonged MRI scans. Stereotactic cryotomy was employed as part of combined treatment for glial tumors in deep or functionally critical brain regions, guided by MRI in six patients. Nine procedures were performed, with tumor volume reduction ranging from one-sixth to complete removal. For glial tumors in deep locations, stereotactic biopsy provided definitive tumor verification, and subsequent cryodestruction served as a palliative approach, even for glioblastomas. Postoperative MRI and CT scans after stereotactic intervention (3–6 months) revealed cerebrospinal fluid cysts at lesion sites. Radiation imaging techniques also effectively identified tumor localization for stereotactic cryodestruction and visualized necrotic foci or hemorrhage-related complications in the postoperative period. Radiation therapy was administered in 101 of 118 operated patients, serving as adjuvant treatment for tumor recurrence or to prevent regrowth in cases of non-radical resection. Dose-related effects were noted: no significant damage to adjacent brain tissue at 45–50 Gy, mild density reduction in one case at 65–70 Gy, and varying levels of necrosis and edema in poorly differentiated tumors. Tumor regression was most pronounced in highly differentiated tumors, with regrowth observed within 3–12 months post-therapy. This comprehensive approach using CT and MRI underscores their critical role in postoperative management, ensuring accurate assessment, identification of complications, and

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guidance for subsequent treatments.

Conclusions

MRI is an advanced neuroimaging technique that effectively identifies glial brain tumors, providing detailed information about their structure, location, size, and extent. CT, on the other hand, complements MRI by offering precise evaluation of density characteristics associated with various histological types of intracerebral tumors. MRI and CT reveal specific features of glial tumors, such as the uniform structure seen in benign astrocytomas and the heterogeneous structure characteristic of anaplastic astrocytomas and glioblastomas. For low-grade astrocytomas, MRI demonstrates superior sensitivity in detecting small areas of contrast medium accumulation and can also identify arteriovenous shunts typically associated with malignant tumors.The sensitivity, specificity, and accuracy of MRI and CT in detecting glial tumors vary based on the tumor's morphological structure. MRI shows a sensitivity of 97.1%, specificity of 82%, and accuracy of 95%, while CT demonstrates a sensitivity of 94.2%, specificity of 75%, and accuracy of 93%.Postoperative evaluation using CT and MRI, particularly with contrast agents, plays a critical role in assessing the completeness of tumor removal, differentiating between reactive postoperative changes, and detecting any residual tumor tissue. CT offers higher sensitivity (97.4%) compared to MRI (89.9%) in such evaluations.Additionally, CT is particularly effective for early detection of postoperative complications, including hematomas at the tumor site, increased postoperative edema, ischemic changes, occlusive hydrocephalus, and pneumocephalus, ensuring timely intervention when necessary.

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